Remarks

Entry of the above-noted amendments, reconsideration of the application, and allowance of all claims pending are respectfully requested. By this amendment, claims 3 and 8 are amended and claims 14-20 are added. These amendments to the claims constitute a bona fide attempt by applicants to advance prosecution of the application and obtain allowance of certain claims, and are in no way meant to acquiesce to the substance of the rejections. Support for the amendments can be found throughout the specification (e.g., paragraphs [0020] - [0024]), drawings (e.g., FIGS. 1-2), and claims and thus, no new matter has been added. Claims 1-20 are pending.

Claim Rejections - 35 U.S.C. § 103:

Claims 1, 3-4, 6-9, and 11-13 are rejected under 35 U.S.C. §103(a) as being unpatentable over Fallahi et al. (U.S. Patent No. 6,436,613; "Fallahi") in view of "prior art stated in admission." Claim 2 is rejected under 35 U.S.C. §103(a) as being unpatentable over Fallahi in further view of Hobbs et al. (U.S. Patent No. 6,870,624; "Hobbs"). Claims 5 and 10 are rejected under 35 U.S.C. §103(a) as being unpatentable over Fallahi in further view of Yoshida et al. (U.S. Patent No. 6,822,982; "Yoshida"). These rejections are respectfully, but most strenuously, traversed.

With regard to the "prior art stated in admission" employed in the rejection, applicants assert paragraph [0002] is not an admission of prior art. Paragraph [0002] follows the heading "Field of the Invention" and applicants assert paragraph [0002] is presented in connection with the invention.

Applicants respectfully submit that the Office Action's citations to the applied references, with or without modification or combination, assuming, *arguendo*, that the modification or

combination of the Office Action's citations to the applied references is proper, do not teach or suggest one or more elements of the claimed invention, as further discussed below.

For explanatory purposes, applicants discuss herein one or more differences between the Office Action's citations to the applied references and the claimed invention with reference to one or more parts of the applied references. This discussion, however, is in no way meant to acquiesce in any characterization that one or more parts of the Office Action's citations to the applied references correspond to the claimed invention.

Applicants respectfully submit that the Office Action's citations to the applied references do not teach or suggest one or more elements of the claimed invention. A careful reading of the Office Action's citations to the applied references fails to teach or suggest, for example, a semiconductor modulator for modulating an optical wave with an RF signal, with an intrinsic layer including first and second diffraction gratings positioned at opposing sides of the intrinsic layer, and first and second electrodes receiving the RF signal and the first and second diffraction gratings slowing the optical wave to match its speed to the speed of the RF signal in the electrodes, as recited, *inter alia*, in applicants' independent claim 1.

Fallahi discloses (column 14, line 6, to column 15, line 8; FIG. 17) an arrangement of a laser diode section 60, surface resonator 62, and electrically controlled grating outcoupler 64. The laser diode section 60 includes a p-type region 68, an intrinsic region 70, and a n-type region 72. The arrangement also includes two feedback gratings 76 adjacent to the gain region in the laser diode section 60. Forward-bias current in the laser diode section 60 injects electrons into the intrinsic region 70 and serves to generate light. The light is then resonated between the feedback gratings 76, thereby forming a resonator with the feedback gratings 76 serving as partial reflectors.

The Office Action's citations to Fallahi do not disclose a semiconductor modulator for modulating an optical wave with an RF signal, as recited, *inter alia*, in applicants' independent claim 1. Referring to the disclosure of Fallahi at column 14, lines 14-28; FIGS 23-24, one purpose of the electrodes is to inject current into the InGaAsP/InP multiple quantum well structure to power the laser. Another purpose of the electrodes of Fallahi is to modify the refractive index of the device using current injection to shift the wavelength (column 14, lines 47-54). Also, the electrodes in Fallahi are used for electrical steering of laser emission from the outcoupler (column 14, lines 3-5), again using current injection. In all three uses, the electrodes do not accomplish high-speed modulation of an optical wave with an RF signal.

Additionally, the Office Action's citations to Fallahi do not disclose electrodes receiving the RF signal and diffraction gratings slowing the optical wave to match its speed to the speed of the RF signal in the electrodes, as recited, *inter alia*, in applicants' independent claim 1. This point is conceded by the Office Action (page 3): "Fallahi does not teach the electrodes/contacts receiving RF signal, ..."

Notwithstanding the admitted deficiency of Fallahi, the Office Action states (page 3): "It would have been obvious to one having ordinary skill in the art at the time the invention was made to apply RF signal to the electrodes in contact with the p-i-n section. The motivation would be to use the RF signal to provide modulation voltage, which in turn varies the optical refractive index of the gratings." Assuming, *arguendo*, that one having ordinary skill in the art would have applied an RF signal to the electrodes in contact with the p-i-n section of Fallahi, such a modification would not have resulted in the configuration recited in applicants' independent claim 1.

For explanatory purposes, applicants refer to exemplary disclosure from the subject patent application. In FIG. 2 of the subject patent application, the optical wave in one example propagates through the waveguide 20 in a direction into the page. FIG. 1 of the subject patent application discloses one example of this propagation, where the optical wave propagates through the waveguide from one end of the waveguide to the other end. Rather than a modulator with a propagation path, Fallahi discloses a laser with a resonant cavity.

Fallahi discloses feedback gratings 76 that reflect the optical wave to create a resonant cavity for the optical wave. The feedback gratings 76 reflect the optical wave back and forth between the two feedback gratings 76. For example, referring to FIG. 17 of Fallahi, the optical wave may travel from the right side towards the left side. The feedback gratings 76 on the left side reflect the optical wave back towards the right side. Then, the feedback gratings 76 on the right side reflect the optical wave back towards the left side. The optical wave continues in this back and forth motion. Because the optical wave in Fallahi resonates in a cavity of the waveguide rather than propagating through the waveguide, Fallahi has no way to match the speed of the optical wave in the waveguide to the speed of an RF signal in a transmission line. The feedback gratings 76 of Fallahi would not serve to match the speed of the optical wave to the speed of an RF signal, as recited, *inter alia*, in applicants' independent claim 1.

Fallahi is not employing the feedback gratings 76 to slow the propagation speed of the optical wave to match its speed to the speed of an RF signal in a transmission line of the electrodes. Nor would the feedback gratings 76 of Fallahi inherently slow the propagation speed of the optical wave to match its speed to the speed of an RF signal since the feedback gratings 76 are formed to provide a resonant cavity where the optical wave reflects back and forth rather than co-propagating with an RF signal. Simply missing from the Office Action's citation to Fallahi is

any mention of a semiconductor modulator for modulating an optical wave with an RF signal, with an intrinsic layer including first and second diffraction gratings positioned at opposing sides of the intrinsic layer, and first and second electrodes receiving the RF signal and the first and second diffraction gratings slowing the optical wave to match its speed to the speed of the RF signal in the electrodes, as recited, *inter alia*, in applicants' independent claim 1.

So, the Office Action's citation to Fallahi fails to satisfy at least one of the limitations recited in applicants' independent claim 1.

The shortcomings of the Office Action's citation to Fallahi relative to certain elements of the claimed invention have been discussed above. The Office Action proposes a combination of the citation to Fallahi with a citation to "prior art stated in admission." As noted above, applicants assert paragraph [0002] is not an admission of prior art. At another point, the Office Action proposes a combination of the citation to Fallahi with citations to Hobbs and Yoshida. However, the Office Action's citations to Hobbs and Yoshida do not overcome the deficiency of the Office Action's citation to Fallahi. Applicants respectfully submit that the proposed combination of the Office Action's citation to Fallahi with the Office Action's citations to Hobbs and Yoshida fails to provide the required configuration, assuming, *arguendo*, that the combination of the Office Action's citation to Fallahi with the Office Action's citations to Hobbs and Yoshida is proper.

Hobbs discloses (column 2, lines 8-19) a technique for producing a narrow optical resonance by exploiting a surface structure waveguide effect. A multiple-step Aztec structure or a simple single-step array of structures such as holes or posts, can be embedded in a region of high refractive index to create a waveguide resonator. Such three or two dimensional structures

are known in the art as "photonic bandgap" crystals and are being developed for confining and directing light into planar channels which mimic electrical circuits.

The Office Action's citation to Hobbs does not disclose a semiconductor modulator for modulating an optical wave with an RF signal, as recited, *inter alia*, in applicants' independent claim 1. Additionally, the Office Action's citation to Hobbs does not disclose electrodes receiving the RF signal and diffraction gratings slowing the optical wave to match its speed to the speed of the RF signal in the electrodes, as recited, *inter alia*, in applicants' independent claim 1. The holes or posts of Hobbs are embedded in a region of high refractive index to create a waveguide resonator to accomplish filtering. Hobbs is not employing the holes or posts to slow a propagation speed of an optical wave to match its speed to the speed of an RF signal in a transmission line of the electrodes. Nor would the holes or posts of Hobbs inherently slow a propagation speed of an optical wave to match its speed to the speed of an RF signal. Simply missing from the Office Action's citation to Hobbs is any mention of a semiconductor modulator for modulating an optical wave with an RF signal, with an intrinsic layer including first and second diffraction gratings positioned at opposing sides of the intrinsic layer, and first and second electrodes receiving the RF signal and the first and second diffraction gratings slowing the optical wave to match its speed to the speed of the RF signal in the electrodes, as recited, *inter alia*, in applicants' independent claim 1.

So, the Office Action's citation to Hobbs fails to overcome the deficiency of the Office Action's citation to Fallahi and fails to satisfy at least one of the limitations recited in applicants' independent claim 1.

Yoshida discloses (column 9, lines 1-28; FIG. 8) a semiconductor laser device 130 with an active layer 3' that comprises a self-organized Quantum dot structure. The Office Action's

citation to Yoshida does not disclose a semiconductor modulator for modulating an optical wave with an RF signal, as recited, *inter alia*, in applicants' independent claim 1. Additionally, the Office Action's citation to Yoshida does not disclose electrodes receiving the RF signal and diffraction gratings slowing the optical wave to match its speed to the speed of the RF signal in the electrodes, as recited, *inter alia*, in applicants' independent claim 1. Simply missing from the Office Action's citation to Yoshida is any mention of a semiconductor modulator for modulating an optical wave with an RF signal, with an intrinsic layer including first and second diffraction gratings positioned at opposing sides of the intrinsic layer, and first and second electrodes receiving the RF signal and the first and second diffraction gratings slowing the optical wave to match its speed to the speed of the RF signal in the electrodes, as recited, *inter alia*, in applicants' independent claim 1.

So, the Office Action's citation to Yoshida fails to overcome the deficiency of the Office Action's citation to Fallahi, fails to overcome the deficiency of the Office Action's citation to Hobbs, and fails to satisfy at least one of the limitations recited in applicants' independent claim 1.

The Office Action's citations to Fallahi, Hobbs, and Yoshida all fail to meet at least one of applicants' claimed features. For example, there is no teaching or suggestion in the Office Action's citations to Fallahi, Hobbs, or Yoshida of a semiconductor modulator for modulating an optical wave with an RF signal, with an intrinsic layer including first and second diffraction gratings positioned at opposing sides of the intrinsic layer, and first and second electrodes receiving the RF signal and the first and second diffraction gratings slowing the optical wave to match its speed to the speed of the RF signal in the electrodes, as recited, *inter alia*, in applicants' independent claim 1.

Furthermore, the Office Action does not allege that the art of record provides any teaching, suggestion, or incentive for modifying the citations to Fallahi, Hobbs, and/or Yoshida to provide the claimed configuration.

For all the reasons presented above with reference to claim 1, independent claims 1-3, 6-8, and 12 are believed neither anticipated nor obvious over the art of record. The corresponding dependent claims are believed allowable for the same reasons as independent claims 1-3, 6-8, and 12, as well as for their own additional characterizations.

Withdrawal of the § 103 rejections is therefore respectfully requested.

In view of the above amendments and remarks, allowance of all claims pending is respectfully requested. If a telephone conference would be of assistance in advancing the prosecution of this application, the Examiner is invited to call applicants' attorney.

Respectfully submitted,

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Dated: July 12, 2005

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